January 6, 2015

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, DC 20554

Re: Applications of Comcast Corp., Time Warner Cable Inc., Charter Communications, Inc., and SpinCo for Consent to Assign and Transfer Control of FCC Licenses and Other Authorizations, MB Dkt. No. 14-57

Dear Ms. Dortch:

On behalf of ARRIS Group, Inc. ("ARRIS"), I am writing in response to a recent report filed in this docket by CTC Technology and Engineering, entitled "The State of the Art and Evolution of Cable Television and Broadband Technology" ("CTC Report").[1] As detailed below, the CTC Report does not provide a complete picture on broadband technologies nor does it recognize the dynamic nature of the broadband marketplace today. ARRIS is filing this letter to better describe this evolving landscape. As a provider of broadband access technology products to both cable and telco service providers, ARRIS has unique insights into the evolving Internet infrastructure in the U.S. and around the world.

ARRIS is a globally-recognized leader in the development and manufacture of equipment and services that underpin the delivery of broadband and video services to consumers. We provide modems, gateways, and other customer premises equipment for delivering high-speed Internet services to cable, telco, and other customers. Likewise, our portfolio of network and cloud solutions includes, among other things, next-generation broadband edge routers (DOCSIS, PON, DSL), high-speed optics and RF transmission products, and video compression, security, and processing equipment.

The CTC Report purports to provide a survey of the capabilities and future evolutionary paths of different broadband platforms. The Report concludes that "because of its ubiquity and its inherently greater capacity than commercial wireless solutions and copper telephone lines [used for DSL], HFC cable networks will be the main pathway for broadband communications

---

[1] The report was prepared for Public Knowledge and filed as an attachment to a Public Knowledge *Ex Parte* Letter in this docket. *See* Public Knowledge Letter, MB Dkt. No. 14-57, Nov. 13, 2014, Att. ("The State of the Art and Evolution of Cable Television and Broadband Technology," CTC Technology and Energy, Nov. 2014).

for most homes and businesses for the foreseeable future."[2] In reaching this conclusion, CTC underscores the robust capabilities of the HFC plant and the cable industry's "commitment to maintaining and upgrading their HFC networks."[3] In contrast, according to CTC, DSL networks have inherent limitations in delivering high-speed Internet service, and CTC appears to cast doubt on whether DSL providers will make the necessary investments in deep fiber deployments and other plant upgrades to deliver higher-speed services.[4]

However, the notion that DSL networks are reaching the "end of the line" as a competitor for high-speed Internet services is belied by marketplace facts. As ADTRAN noted in a recent filing in this docket, DSL technology continues to evolve, and advances in pair-bonding and vectoring are enabling DSL providers to increase speeds and improve performance over longer copper loops. For example, using vectoring, "DSL download speeds of 100 Mbps can be provided on loops of up to 1,800 feet over a single copper loop pair, or that same speed can be provided at up to 3,400 feet with two-pair bonding."[5]

Moreover, DSL providers also are investing in next-generation technology innovations that involve the deployment of deep fiber and outside network equipment closer to the premises. One such technology, known as G.fast, significantly increases speed over copper by using wider frequency profiles than traditional DSL. If fiber is pushed to distribution points (i.e., cabinets) closer to the residence, G.fast has the capability of delivering speeds of up to *1 Gbps* using legacy copper loops.[6] G.fast thereby provides a particularly attractive competitive opportunity for delivering such broadband services in apartment buildings and other high-density settings as well as single family residences where legacy copper loops are prevalent. G.fast standards have been approved by ITU, and a test suite and certification program is being developed for G.fast systems.[7] In addition, several G.fast-enabled gateway products were demonstrated at Broadband World Forum in October 2014 for planned deployments in 2015.

---

2 CTC Report at 1.

3 *Id.* at 2.

4 *See id.* at 9-10; *see also id.* at 2 (noting that "the average available DSL speeds are 1.5 Mbps to 6.0 Mbps for the large companies and less than 1.5 Mbps for the small ones" and concluding that "DSL technology will not be able to increase capacity far beyond those speeds or consistently provide service across typical copper lines without substantial upgrades, such as fiber-to-the-curb (FTTC) or other costly re-engineering and construction").

5 ADTRAN Reply Comments, MB Dkt. No. 14-57, at 4 (Nov. 7. 2014).

6 G.fast can achieve speeds of up to 500 Mbps at copper loop lengths of 250 meters, and speeds of up to 1 Gbps at copper loop lengths of 100 meters.

7 *G.Fast Broadband Standard Approved And On The Market*, ITU Press Release (Dec. 5, 2014), *available at* http://www.itu.int/net/pressoffice/press_releases/2014/70.aspx#.VJhVgT8A. Furthermore, G fast-capable modem chipsets are now commercially available. *See, e.g.*, *World's First G.Fast Chipsets Announced by Sckipio*, Sckipio News Release (Oct. 7, 2014), *available at* http://www.sckipio.com/world-first-g-fast-chipsets-announced/.

These developments help underscore the point that Chairman Wheeler has made that "the old copper infrastructure has a new future"[8] and that "technological advances are making DSL a powerful means of supplying broadband in some places for some purposes, at a fraction of the cost, and the ubiquity of copper creates competitive opportunity."[9]

Aside from understating ongoing advances in DSL technologies, the CTC Report also does not provide an accurate picture of the dynamism in the broadband marketplace today. It is simply not the case that one platform (cable) is racing ahead of competing platforms. Rather, *all* platforms are racing ahead with network upgrades in order to keep up with growing consumer demand for video and other Internet-delivered services. That is a business imperative across the marketplace. LTE and other advanced wireless and WiFi technologies are providing greater mobility and convenience for consumers in accessing content on a wide and growing array of devices. Likewise, wireline providers are making their own investments in deep fiber, outside plant, and new customer equipment to meet growing bandwidth demands. As noted, DSL providers are making these necessary investments to improve the capabilities of their platform.[10]

Cable operators are doing the same. In this regard, the CTC Report does not give the full sense of this level of investment. Contrary to the suggestions in the Report, upgrading cable broadband networks to achieve next-generation DOCSIS speeds is not simply a matter of upgrading CMTSes and cable modems.[11] Rather, similar to DSL investments, it also entails investment in fiber and outside plant to unlock more capacity in the network. The HFC platform is evolving towards serving smaller clusters of customers as cable operators build fiber deeper into neighborhoods, add optical nodes, and make other plant upgrades. In this regard, cable operators are currently making investments to replace first-generation CMTS platforms with a new Converged Cable Access Platform (or CCAP) in order to bond more QAM channels and provide faster speeds over the existing HFC network plant. A second investment wave will be needed in the coming years to deploy DOCSIS 3.1 technology capable of delivering speeds of several Gigabits per second.[12] Likewise, the cable industry's transition from hybrid

---

[8] Remarks of Tom Wheeler, Chairman, Federal Communications Commission, Mid-Atlantic Venture Association (Nov. 4, 2014).

[9] Remarks of Tom Wheeler, Chairman, Federal Communications Commission, COMPTEL Fall Convention & Expo (Oct. 6, 2014). The continued vitality of DSL is further underscored by the fact that DSL platforms are being upgraded outside the United States as well. *See, e.g.*, Broadband Coverage in Europe 2013, European Commission Report at 21(2014), *available at* http://ec.europa.eu/digital-agenda/en/news/study-broadband-coverage-europe-2013 (finding that VDSL [very-high-speed DSL] was the fastest growing fixed broadband technology for the second year in a row, which "clearly shows the impact of recent decisions of European network operators to invest into upgrades of existing copper networks alongside (or in some cases instead of) FTTP deployments").

[10] *See* AT&T/DirecTV Public Interest Statement, MB Dkt. No.14-90, at 10-12 (June 11, 2014) (describing AT&T investment in its wireline plant).

[11] *See* CTC Report at 27-30.

[12] *See* Comcast/Time Warner Cable Public Interest Statement, MB Dkt. No. 14-57, at 30-35 (April 8, 2014) (describing Comcast's investment in faster broadband speeds and next-generation DOCSIS). DOCSIS 3.1 will allow burst speeds of up to 5 Gbps on first-generation customer premises equipment, and potentially 10 Gbps on future devices. Furthermore, DOCSIS 3.1 will facilitate lower latency for Internet-delivered services, thereby providing a better customer experience.

analog/digital cable service to all-digital service is freeing up cable bandwidth for faster Internet, and the industry's eventual transition to all-IP cable service will continue that trend.[13]

In addition to the foregoing technology trends, there is an important distinction to be made between the cable HFC last-mile architecture and the copper twisted pair last-mile architecture. In an HFC network, the coax portion that connects the home to the fiber distribution network is a shared connection – multiple homes, often hundreds of homes, share a single broadband pipe. In contrast, in a DSL network, the copper portion that connects the home to the fiber distribution network is a dedicated connection – a single home has the full benefit of the broadband pipe. For example, a DOCSIS 3.1 connection at 5-10 Gbps will be shared with many customer while a G.fast connection at 1 Gbps will be provided to each customer. This important distinction makes the direct speed comparisons somewhat misleading. Rather, an apples-to-apples comparison of the true user experience must account for how many users are simultaneously using the HFC DOCSIS broadband connection.

In light of these marketplace developments, ARRIS firmly believes that both cable HFC and telco copper networks are competitive, viable alternatives, and service providers of both technology platforms will thrive in a light-touch regulatory environment as the consumer demand for Internet bandwidth and services continues to grow. It is simply not credible for the CTC to argue that cable will be the "main pathway for broadband communications . . . for the foreseeable future." The marketplace is responding with a variety of different pathways for meeting a range of different consumer needs, and the overall trend across platforms is towards greater investment and innovation and faster speeds.

ARRIS would be pleased to discuss this topic further. Please feel free to contact me if I can provide you with any additional information.

Sincerely,

/s/ Jason E. Friedrich

Head of U.S. Government &
Regulatory Affairs
ARRIS Group, Inc.
101 Tournament Drive
Horsham, PA 19044

13 *See id.* at 70-83.